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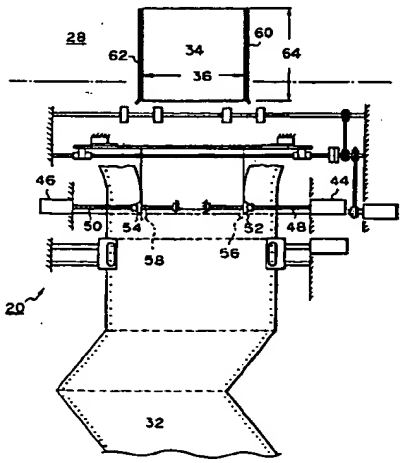
(54) CUTTER UNIT IN AUTOMATIC ENCLOSING AND SEALING APPARATUSES.

(57) A continuous document cutter unit constituting a part of an automatic enclosing and sealing apparatus and adapted to turn a series of continuous sheets into cut sheets and supply the cut sheet to the subsequent unit. In this cutter unit, setting information directly or indirectly showing at least the width of a cut sheet is sent to a setting information supply means, whereby a slitter for cutting the continuous sheet to a predetermined width and/or a cut sheet transfer guide in the subsequent unit can be automatically positioned, and information on the position of the cut sheet transfer guide in the subsequent unit and setting information directly or indirectly showing the width of a cut sheet are sent to the setting information supply means, whereby the slitter for cutting the continuous sheet to a predetermined width can be automatically positioned.

Fig. 4



EP 0 685 304 A1

[Technical Field]

The present invention relates to an enclosing and sealing apparatus and, particularly, to a continuous sheet cutting unit constituting a part of an automatic sheet enclosing and sealing apparatus for cutting a continuous sheet into a plurality of single sheets and supplying the single sheets to a subsequent unit.

[Background Art]

Usually, in an automatic sheet enclosing and sealing apparatus, information processed by a computer is printed continuously on a continuous sheet and, thereafter, the continuous sheet is conveyed to a cutter unit and the upper and lower edge portions and the left and right edge portions of the single sheets are cut by means of longitudinal and transverse knives so as to provide a single sheet and, thereafter, the single sheet is conveyed to a subsequent unit.

A prior art cutter unit 1 will now be explained with reference to Fig. 1. The unit 1 comprises a continuous sheet conveying system 3 for conveying a continuous sheet 2 having printed thereon various information by a printer unit (not shown in the drawing) and being folded alternately along transverse perforations or being wound into a roll toward a subsequent unit, a cutting system 4 for cutting the continuous sheet 2 conveyed by the continuous sheet conveying system 3, and a single sheet conveying system 6 for conveying a single sheet 5 being cut by the cutting system 4 into the single sheet to a subsequent unit.

The continuous sheet conveying system 3 is also known as a tractor unit and acts to convey the continuous sheet 2 in the vertical directions of the sheet. The conveying system 3 conveys intermittently the continuous sheet 2 by pawls (not shown in the drawing) engaging with feeding holes 7 provided in opposite side portions of the continuous sheet 2. The location of the pawl is adjustable in a direction perpendicular to the feeding direction or the left and right direction so as to match the widthwise dimension of the continuous sheet 2. Displacement and adjustment of the pawl are usually performed manually, but in some recent and expensive apparatus, the width of the continuous sheet is detected and, the location of the pawl is adjusted automatically.

The cutting system 4 is constituted of a transverse knife and longitudinal knives for cutting the upper and lower portions and the left and right portions of the continuous sheet 2. The longitudinal knives for cutting the left and right edge portions 2a and 2b from the continuous sheet 2 so as to make a printing portion having the width W at the central printing portion of the continuous sheet is constituted of combined knives 8 consisting of respective two discs called slitters and arranged along two upper and lower shafts. The transverse knife 9 for cutting the upper and lower portions to make the single sheet having the length L is constituted of two combined blades 9a and 9b of a guillotine type.

The slitters 8 are directly driven by a motor 10 which rotates continuously and acts to cut off the left and right edge portions of the continuous sheet 2 being supplied by a tractor so as to form a predetermined width W of the single sheet. Since the predetermined width W may vary, the slitters can be adjusted manually so as to displace the location along the two upper and lower mounting shafts.

The transverse knife 9 consisting of two combined blades of the guillotine type acts to cut off the top and bottom portions of the continuous sheet 2 with the widthwise dimension being defined by the slitter 8 so as to form the single sheet 5 of a predetermined dimension. The transverse knife 9 acts to cut the continuous sheet 2 between a fixed blade 9b and a movable blade 9a being driven vertically by a cam 12 which is driven by a power source such as an electric motor 10 through an electromotive clutch 11. The cutting operation of the transverse knife 9 is performed at the stopping cycle between the conveying cycles of a tractor unit 3 which convey the continuous sheet 2 intermittently. Thus, the distance of the convey of the tractor unit is equal to the vertical distance L of the single sheet 5 being cut. The single sheet conveying system 6 consists of conveying rollers 14 which convey the single sheet 5 being cut by the cutting system 4 from the cutter unit 1 to a convey guide 13 of a subsequent unit. The single sheet 5 conveyed on the convey guide 13 of the subsequent unit has the width dimension W defined by the slitter 8, and the position of the sheet 5 is restricted by the slitter 8. Usually, in the sheet enclosing and sealing apparatus, a number of functional units are combined to perform a desired integrated function, thus, the mechanical positional relationship between subsequent units is very important in such apparatus. The conveying rollers 14 are driven by a motor rotating continuously except in an error condition, and the single sheet 5 being cut is instantly conveyed to a predetermined position of a subsequent unit. The motor for rotating the conveying roller may be the motor 10 for driving the slitters 8.

In the apparatus, the width W of the single sheet 5 being cut and the positional relationship between the single sheet 5 and the conveying guide 13 of the subsequent unit are determined simultaneously by adjusting the position of the left

and right slitters 8. Namely, in adjusting the position of the left and right slitters 8, it is important to satisfy simultaneously these two requirements, or the widthwise dimension of the single sheet being cut and the positional relationship of the single sheet being conveyed. Thus, it is very difficult and time consuming to adjust the position of the slitters. Further, any automatic adjusting means utilizing such as a motor and the like have not been available and the slitters 8 are very sharp cutting edges, and the adjusting operation is very dangerous since the operator is required to perform the positional adjustment manually.

[Disclosure of the Invention]

According to the present invention, in considering that the distance between the left and right slitters can quantitatively and unitarily be defined when the widthwise distance of the single sheet is specified, that because the position of the left and right slitters corresponds to the position of the single sheet the position of the convey guide of the subsequent unit can be automatically adjusted based on the positional information of the slitters, and that the position of the left and right slitters can be automatically adjusted based on the positional information of the convey guide of the subsequent unit; the adjustment of the dimension of the slitters, and of the position of the convey guide of the subsequent unit can be performed automatically.

Thus, the working efficiency of the cutter unit can be improved remarkably, and the need for a dangerous manual adjusting operation can be obviated.

[Brief Description of the Drawings]

Fig. 1 is a drawing showing the general operation of a prior art cutter unit;
Fig. 2 is a flow chart showing one example of operation according to the invention;
Fig. 3 is an enlarged flow chart showing a portion of the operation of Fig. 2;
Fig. 4 is a view showing a cutter unit driven according to the flow chart shown in Figs. 2 and 3;
Fig. 5 is a flow chart showing the operation of the control circuit shown in Fig. 3;
Fig. 6 is a flow chart showing the processing of the microcomputer shown in Fig. 5; and
Fig. 7 is a drawing showing the process for finding the position of respective slitters from th flow chart of Fig. 6.

[Best Mode for Executing the Invention]

Figs. 2 and 3 are flow charts showing one example of operational procedure according to the invention and, particularly, that showing a system in which the left and right slitters are driven respectively by independent stepping motors based on the width information of the single sheet. Fig. 4 shows an embodical cutter unit driven by the flow charts of Figs. 2 and 3. The unit shown in Fig. 4 differs from the device of Fig. 1 in that the left and right slitters are independently screw-threadingly engaging with independent ball-screws which, in turn, are driven by independent stepping motors.

In Fig. 2, various control information 22 of a cutter unit 20 are supplied to an operation panel 24 of the cutter unit 20 or from a control unit 26 to the cutter unit 20 and various units including a subsequent unit 28, through a communicating passage 30 connecting mutually these units. The control information 22 includes (1) the information relating to the width of the single sheet 34 being cut out of the continuous sheet 32, (2) the information relating to the longitudinal length 64 of the single sheet 34 being cut out of the continuous sheet 32, (3) the information relating to the delivered position of the single sheet 34 being delivered out of the cutter unit (which is such as the center-standard, the edge-standard, the dimension of the continuous sheet 32, the separating dimension between respective single sheet 34, and the like). In the apparatus shown in Fig. 4 which is designed to have a standard as being based on the center of respective units, the information relating to the delivered position of the single sheet 34 of the item (3) may be a mark "0" showing the center. It will be noted that the system of above described type are usually designed to have the standard being based on the center of respective units, thus, such information do not constitute indispensable information. Further, the control information include a plurality of usual information for operating the cutter unit 20 automatically and as desired. The information 22 being set as above is, as shown in detail in Fig. 3, converted into the positional information to the right side stepping motor 44 and to the left side stepping motor 46 by the control circuit 38 in the cutter unit 20 and through the right side motor driving circuit 40 and the left side motor driving circuit 42, and the motors drive the right slitter 52 and the left slitter 54 to predetermined positions through respective ball screws 48 and 50. The rotating force of the ball-screws 48 and 50 is also transmitted to ball-screws being arranged lower side of the continuous sheet 32 and not shown in the drawing. These lower side ball-screws act to drive slitters 56 and 58 being arranged lower side of the continuous sheet 32 by the distance same to

th slitters 52 and 54 and in the sam direction. It will be noted that independent motor control circuits are provided for the left and right side of the continuous sheet 32 since the center of the apparatus does not necessary lie on the center line of the continuous sheet 32.

The positional information is, by the function of the control circuit 38, supplied through the communication path 30 to the control circuit of subsequent unit 28 as the setting information. While, in the subsequent to which the setting information is supplied, the positioning of conveying guides 60 and 62 is performed by means known per se (not shown in the drawing) and based on the setting information. Thus, the position of the single sheet ejected from the cutter unit 20 and the position of the conveying guides 60 and 62 of the subsequent unit 28 is automatically aligned.

Incidentally, as shown in Fig. 5, the control circuit 38 shown in Fig. 3 is usually a processing circuit utilizing a microcomputer and, in the control circuit 38, the information connected to the control unit 26 and the information connected to the subsequent unit 28 are, through signal receiving and transmitting circuit respectively and, by integrally adding the information from the operation panel 24, processed in computer so as to generate the driving signal for the stepping motors of the left and right slitters.

Fig. 6 is a flow chart of the process in the microcomputer and the driving process of the motors in Fig. 5. In Fig. 6, the positioning of the left and right slitters is started by the input A of the sheet width information from the operation panel. The position to which the left and right slitters are moved is calculated from the information A being inputted. The calculating process will now be explained referring Fig. 7. As shown in Fig. 7, the maximum distance B between the left and right slitters is the slitter distance (mm) when the slitters are located at home positions. The number of the steps of the motor of the distance B is calculated by multiplying the distance B with a coefficient k which is determined from the mechanism. The calculation process is performed based on the conversion value. For example, when one step of the motor corresponds to the distance 0.05 mm, k = 0.05 step/mm. Thus, in conversing the maximum distance B between the left and right slitters into the number of steps, (B × k) steps are obtained, which is put as C. Next, the target position to which the slitters are displaced is calculated from the width A of the sheet. By setting the value S as the converted number of the width A of th sheet, (S = A × k) is obtained. The subsequent description will be made based on the converted number of the steps of the motor. As shown in Fig. 7, the number of steps P_R and P_L of the right and left slitter positions can be obtained by the subsequent equation.

$$P_R = P_L = [(\text{maximum distance C of slitters}) - (\text{width S of sheet})] / 2$$

Next, the amount of displacement of the slitters is calculated. The position of the right and left slitters at present are respectively set as (OLD P_R) and (OLD P_L). Thus, when the present position of the slitters are the home position, the (OLD P_R) and (OLD P_L) are zero respectively.

$$\text{Amount of movement of right slitter } D_R = P_R - (\text{OLD } P_R)$$
$$\text{Amount of movement of left slitter } D_L = P_L - (\text{OLD } P_L)$$

It will be noted that the value D_R and D_L are values having signs (+) or (-) which shows the direction of the displacement.

Then, the slitters are displaced by driving the stepping motors. The left and right motors may be rotated simultaneously.

The information passing through the communication passage 30 of Fig. 3 includes the subsequent (not exclusively):

(1) Control information such as the following:
- a. START (action starting command for the system)
- b. STOP (stopping command for the system)
- c. ERROR (notifying an error condition in either one unit in the system)

(2) Setting information
- a. Cutter unit
  - WIDTH (the width of cut sheet)
  - LENGTH (longitudinal length of continuous sheet)
  - CUT FORM (double cut or single cut)
- b. Relating to the subsequent unit
  - i) from the cutter unit to the subsequent unit
    - POSITION of LEFT SLITTER
    - POSITION of RIGHT SLITTER
    - LENGTH of SINGLE SHEET (the single sheet supplied from the cutter unit)
  - ii) from the control unit and through the cutter unit (when the information is collected to the control unit through transmitting circuit and, is transmitted to respective units)
    - POSITION of LEFT SLITTER
    - POSITION of RIGHT SLITTER
    - LENGTH of SINGLE SHEET (the single sheet supplied from the cutter unit)
    - OTHER INFORMATION (when the subs - quent units include a unit for folding the

single sheet, the folding form and the like)

In the abov described mbodiment, description has been made with respect to the information transmitted from th cutter unit 20 to the subsequent unit 28 are utilized as the positional information of the left and right slitters. However, according to the present invention, other information can also be utilized effectively. For example: (1) The width information of the single sheet is transmitted to the subsequent unit. In this case, the "single sheet width" information supplied from the control unit may directly be transmitted. (2) The single sheet width information and the single sheet position information are transmitted to the subsequent unit. This case is similar to the (1) case, but, is effective when the conveying mechanism is designed to have the standard not located at the center. (3) The information of the conveying standard of the subsequent unit is transmitted to the cutter unit, and the information of the width of the single sheet is supplied from either of the control unit and the operation panel. Accordingly, the present invention is not limited to that the necessary information are supplied from either of the control unit and the operation panel. The necessary information may be collected to the control unit through transmitting passages and may be supplied to respective units. For example, the information of conveying standard to the subsequent units may be transmitted to the cutter unit. Further, when the constitution of the system is clearly given, the information may be transmitted directly between respective units.

As described above, according to the present invention, by enabling the automatic adjustment of the positioning of the slitters, it is possible to automatically align the single sheet conveying position and the width of the single sheet, which improves substantially the operability of the system. Further, the accuracy of the width of the single sheet is comparable to the accuracy of the device for positioning the slitters, which omits the necessity for measuring the width of the single sheet. Further, since the position of the slitters can be adjusted automatically the adjusting operation performed at dangerous location can be omitted and the safety of the operators can be improved remarkably.

Claims

1. A cutter unit in an automatic enclosing and sealing apparatus and having supply means for supplying setting information, in which at least the setting information of the width of single sheet being cut is supplied directly or indirectly to the supply means, thereby means for cutting the widthwise dimension of the single sheet can be automatically positioned.

2. A cutter unit in an automatic enclosing and sealing apparatus according to claim 1, in which, based on the setting information indicating directly or indirectly the width of the single sheet, widthwise conveying guides of the single sheet in the subsequent unit can automatically be located.

3. A cutter unit in an automatic enclosing and sealing apparatus according to claim 1 or 2, in which, based on the basic information of widthwise conveying guides of the single sheet in the subsequent unit and on the setting information indicating directly or indirectly the width of the single sheet, the position of the cutter unit is automatically located.

Fig. 1

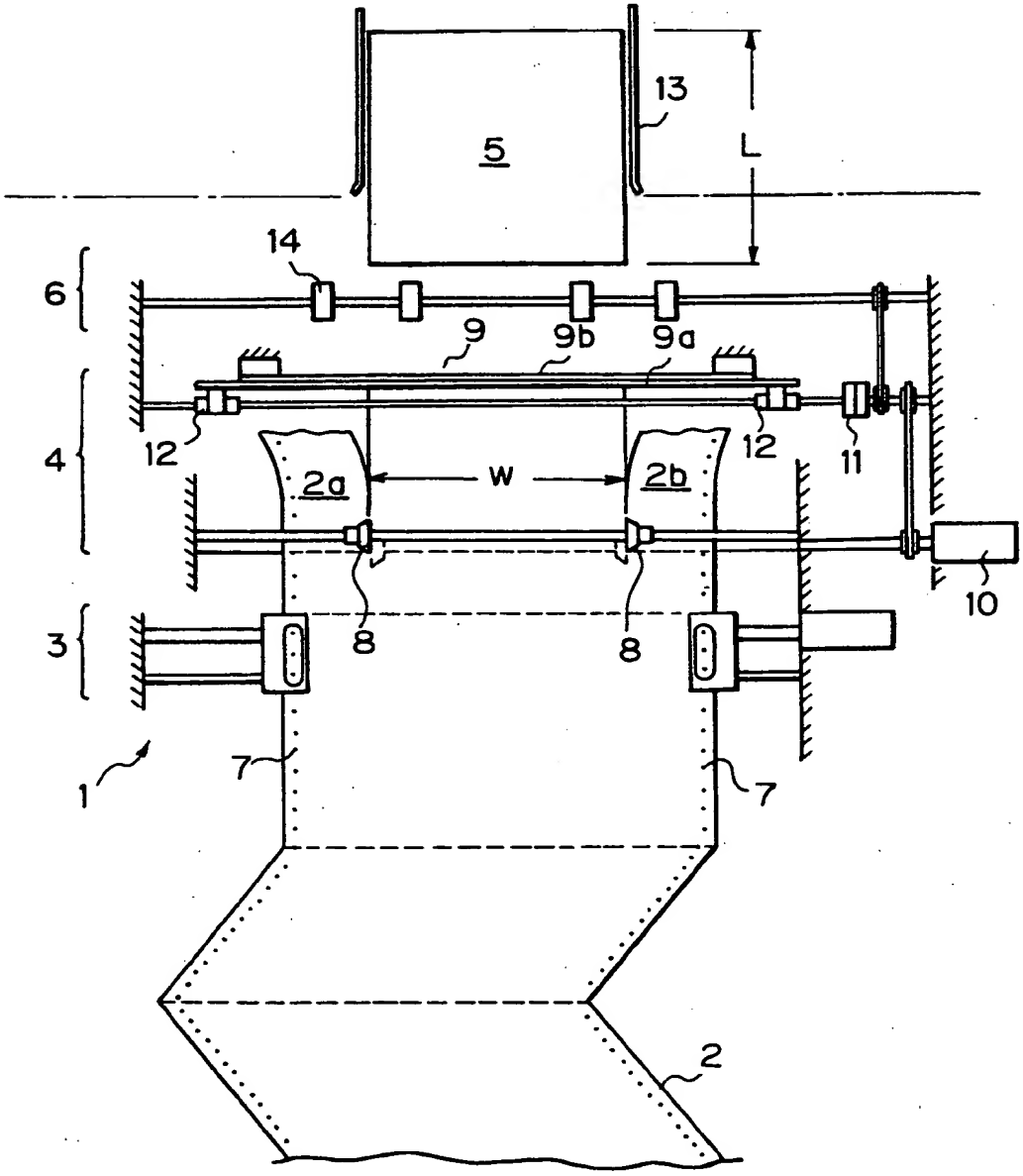


Fig. 2

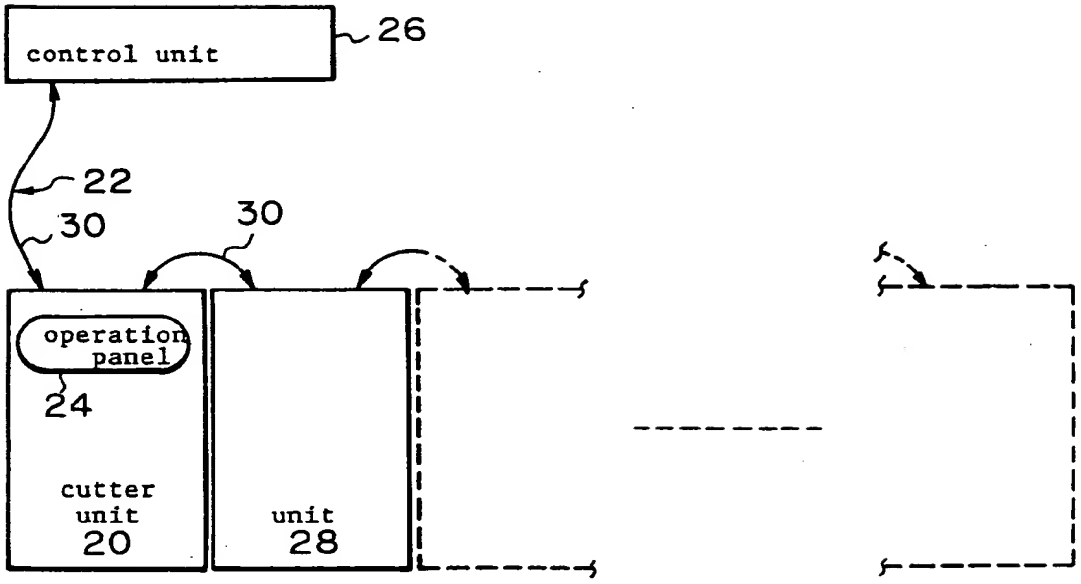

control unit
26
22
30
30
operation panel
24
cutter unit 20
unit 28

Fig. 3

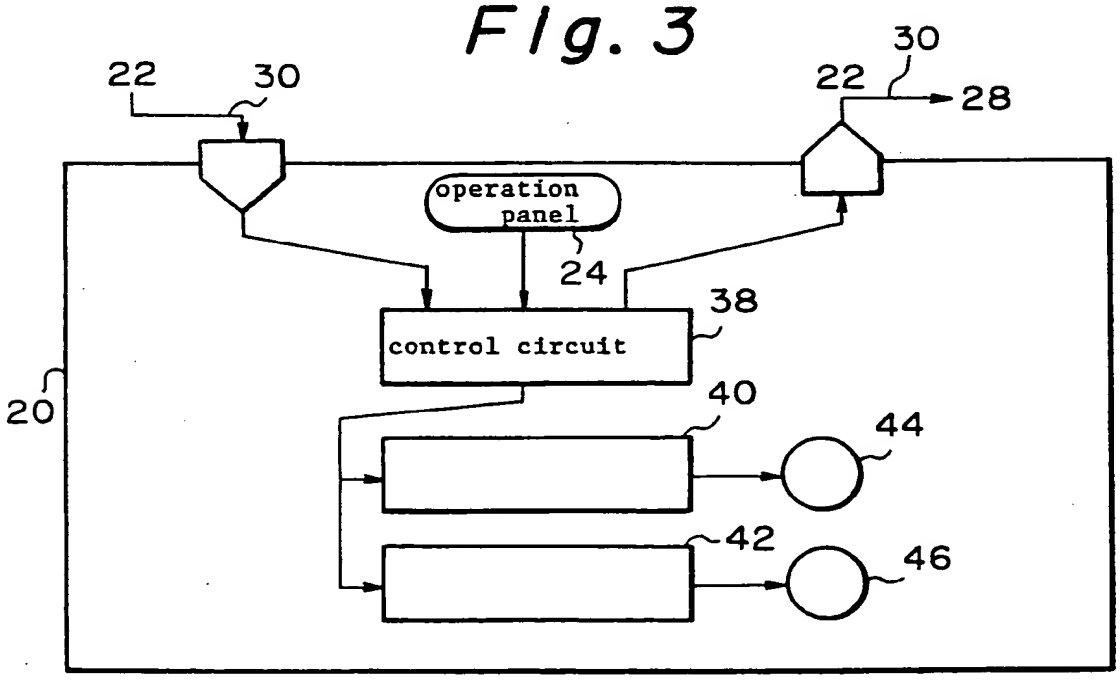

22
30
22
30
28
operation panel
24
38
control circuit
20
40
44
42
46

Fig. 4

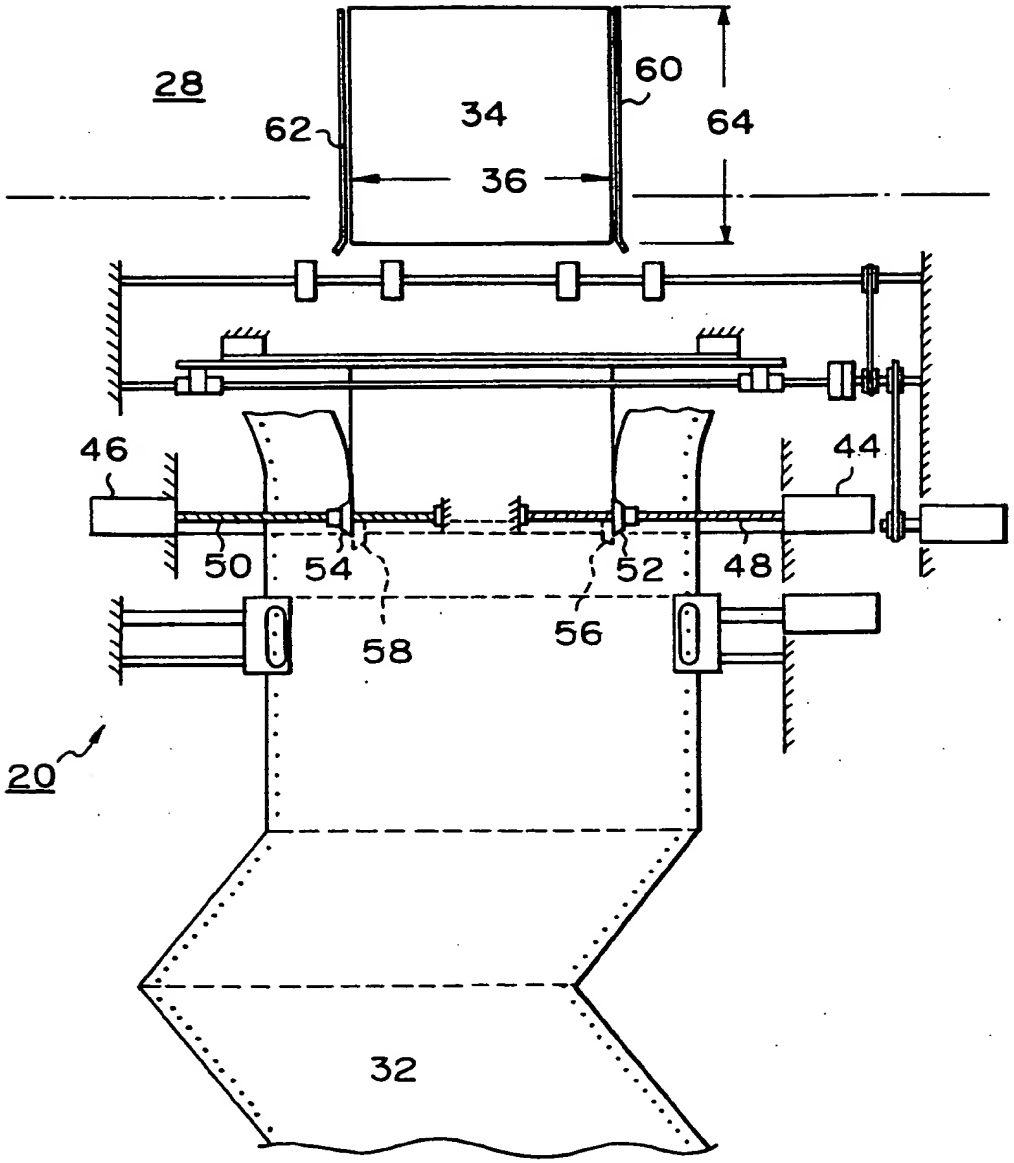


Fig. 5

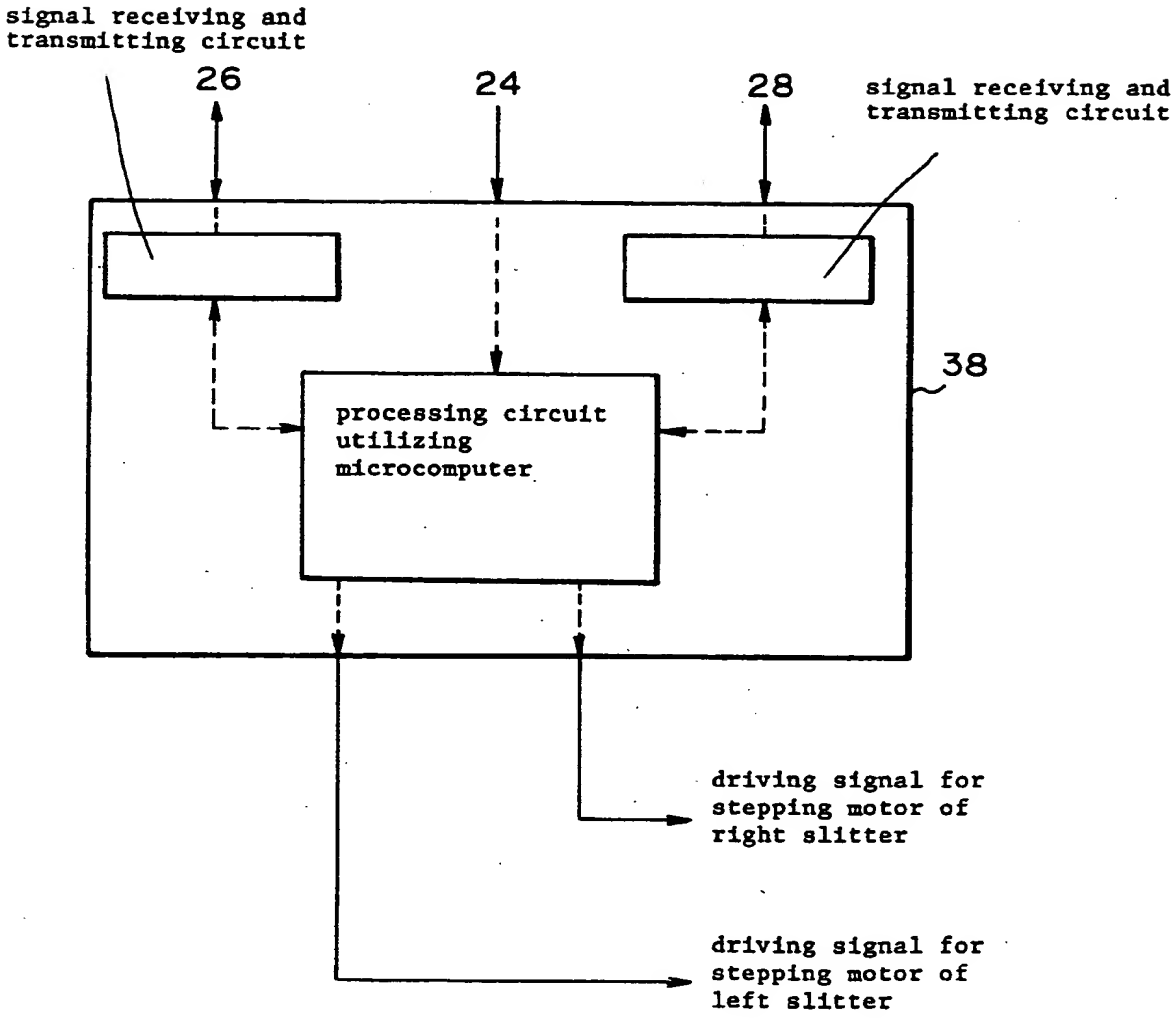

signal receiving and transmitting circuit
26
24
28
signal receiving and transmitting circuit
38
processing circuit utilizing microcomputer
driving signal for stepping motor of right slitter
driving signal for stepping motor of left slitter

Fig. 6

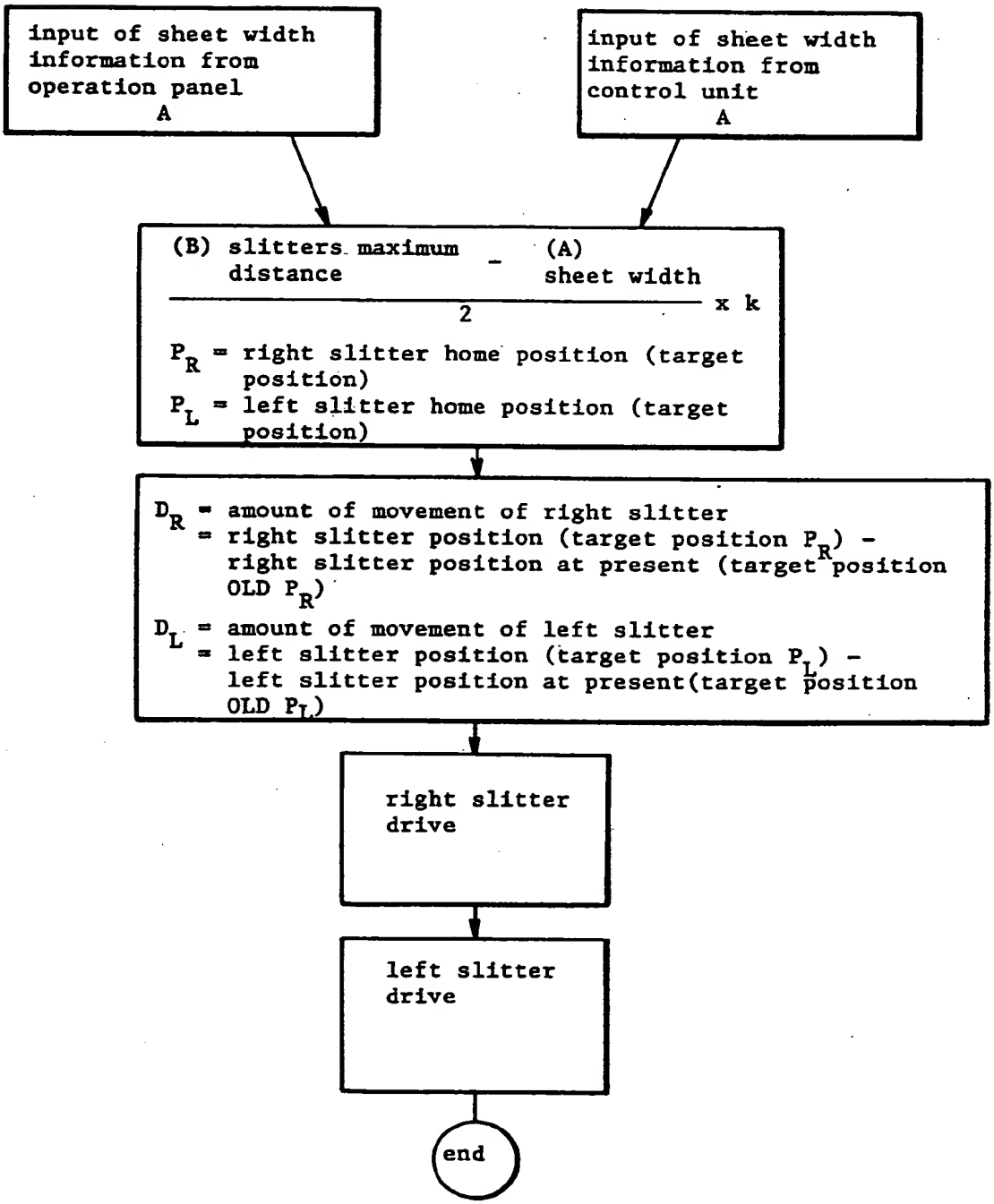
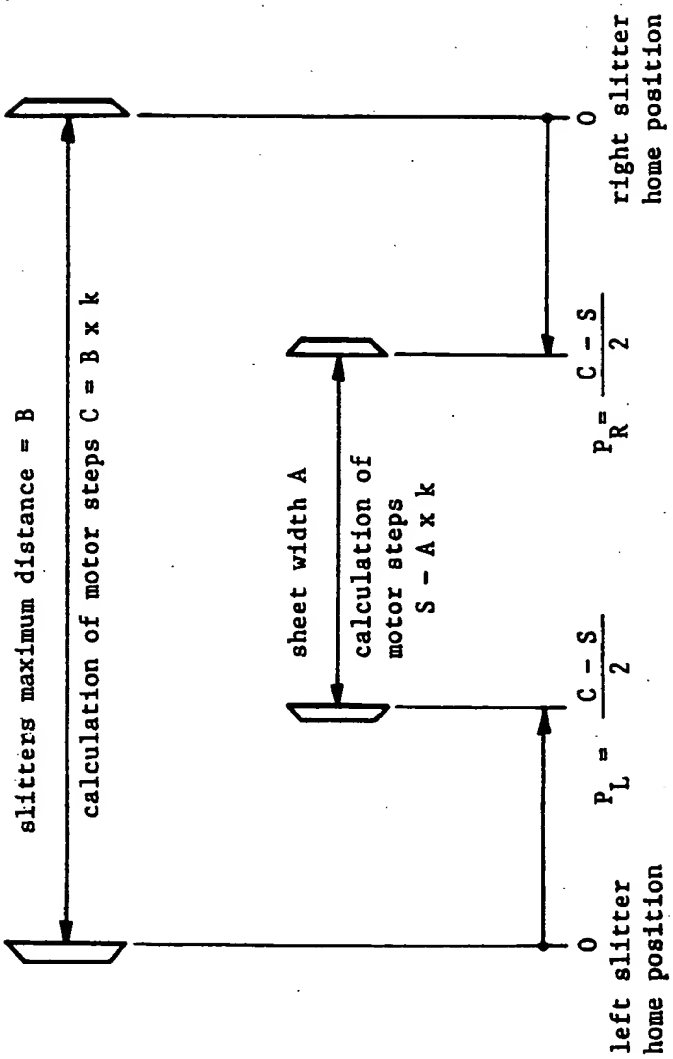

input of sheet width information from operation panel
A
input of sheet width information from control unit
A
(B) slitters maximum distance − (A) sheet width / 2 x k
P_R = right slitter home position (target position)
P_L = left slitter home position (target position)
D_R = amount of movement of right slitter = right slitter position (target position P_R) − right slitter position at present (target position OLD P_R)
D_L = amount of movement of left slitter = left slitter position (target position P_L) − left slitter position at present(target position OLD P_L)
right slitter drive
left slitter drive
end

Fig. 7


slitters maximum distance = B
calculation of motor steps C = B x k
sheet width A
calculation of motor steps S - A x k
0
left slitter home position
$P_L = \frac{C - S}{2}$
$P_R = \frac{C - S}{2}$
0
right slitter home position

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP92/01410

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl^5 B26D5/02, B26D7/26, B43M5/04, B65H35/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Int. Cl^5 B26D5/02, B26D7/26, B43M5/04, B65H35/02

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho 1947 - 1991
Kokai Jitsuyo Shinan Koho 1971 - 1991

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP, A, 58-90998 (Sato Seisakusho K.K.), May 30, 1983 (30. 05. 83), Line 14, upper right column to line 3, lower left column, page 576, line 20, lower right column, page 576 to line 6, upper left column, page 577, & GB, B2, 2114540 (12. 06. 85)	1
Y	JP, A, 2-30493 (Fuji Photo Film Co., Ltd.), January 31, 1990 (31. 01. 90), Line 6, upper left column to line 10, upper right column, page 729 (Family: none)	1
Y	JP, A, 61-131899 (Kataoka Kikai Seisakusho K.K.), June 19, 1986 (19. 06. 86), Line 19, upper left column to line 7, lower left column, page 567 (Family: none)	1

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier document but published on or after the international filing date
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"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
January 20, 1993 (20. 01. 93)	February 2, 1993 (02. 02. 93)
Name and mailing address of the ISA/ Japanese Patent Office	Authorized officer
Facsimile No.	Telephone No.

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP92/01410

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP, A, 62-211220 (Sharp Corp.), September 17, 1987 (17. 09. 87), Lines 5 to 12, lower left column, page 117 (Family: none)	2, 3
Y	JP, A, 61-229748 (NEC Corp.), October 14, 1986 (14. 10. 86), Lines 4 to 14, upper left column, page 273 (Family: none)	2, 3